

claim:

→ imaging

1. An apparatus for [testing] a sample of biologic fluid quiescently residing within a chamber, said apparatus comprising:
 - 5 a field illuminator for selectively illuminating a field of the sample, said field having a known or ascertainable area;
 - 10 a positioner, which is operable to selectively change the position of one of the chamber or said field illuminator relative to the other of the chamber or said field illuminator, thereby permitting selective illumination of a plurality of said sample fields within the chamber;
 - 15 means for determining one of a through-plane thickness or a volume of each said sample field; and → CCD camera
 - 20 an image dissector, for converting an image of light passing through or emanating from each said field of the sample into an electronic data format useful for test purposes.
- 25 3. An apparatus according to claim 1, further comprising means for retrieving information concerning the chamber which information is used in the performance of one or more tests on the biologic fluid sample by said apparatus.
4. An apparatus according to claim 2, wherein said means for retrieving information includes a label reader for reading a label relating to the chamber.
- 25 5. An apparatus according to claim 3, wherein said label reader optically reads labels.

6. An apparatus according to claim 3, further comprising:
a programmable analyzer having a central processing unit;
wherein said label reader transfers said information to said programmable analyzer, and
said programmable analyzer interprets said information, identifying said one or more tests to
5 be performed on the biologic fluid sample.

7. An apparatus according to claim 6, wherein said programmable analyzer contains a plurality of instructions for performing said one or more tests.

10 8. An apparatus according to claim 7, wherein said plurality of instructions are contained
remote from said programmable analyzer and are accessed through said programmable
analyzer.

15 9. An apparatus according to claim 7, wherein said plurality of instructions includes
means for controlling said field illuminator and said positioner.

10. An apparatus according to claim 9, wherein said positioner includes means for
spatially locating said chamber relative to said field illuminator;
wherein said means for spatially locating said chamber relative to said field illuminator
20 enables said field illuminator to be aligned with any particular spatial location within said
chamber.

11. An apparatus according to claim 10, wherein a coordinate address is used to describe
particular spatial locations within said chamber.

25 12. An apparatus according to claim 11, wherein said information retrieved by said label
reader relates to features within the chamber.

13. An apparatus according to claim 1, wherein said field illuminator comprises:
a light source which produces light within a wavelength range broad enough to be
useful for a plurality of tests on the biologic fluid sample; and
5 an assembly of objective optics, wherein said optics direct light emanating from said
sample field or transmitted through said sample field into a known or ascertainable area image
of light on said image dissector.

14. An apparatus according to claim 13, wherein said assembly of objective optics
comprises:
an objective lens;
a focusing mechanism, said mechanism for selectively adjusting the position of said
objective lens relative to the chamber; and
a light filter for blocking or passing certain wavelengths of said light;
15 wherein other wavelengths of said light emanating from said light source pass through
said objective lens and said light filter and into said image dissector, or are blocked,
respectively.

15. An apparatus according to claim 14, wherein said field illuminator directs light into said
20 sample within the chamber and collects light fluorescing out of said sample.

16. An apparatus according to claim 15, wherein said light filter comprises:
a plurality of light source excitation filters;
a plurality of sample emission filters;
25 wherein said light source excitation filters block selected wavelengths of said light
emanating from said light source and said sample emission filters block selected wavelengths of
said light fluorescing out of said sample.

17. An apparatus according to claim 16, wherein said light source excitation filters are mounted on a first wheel and said sample emission filters are mounted on a second wheel and both said filters are rotatable into and out of a path of said light; and

5 wherein said field illuminator further comprises means for synchronizing said first wheel and said second wheel such that all desirable combinations of said light source excitation filters and said sample emission filters can be used during said tests.

10 18. An apparatus according to claim 16, wherein said field illuminator further comprises:

 a light diverting prism; and

 a reference detector having means for quantifying an energy level of said light emanating from said light source, wherein said quantified energy level is selectively used in evaluating said light fluorescing out of said sample.

15 19. An apparatus according to claim 14, wherein said field illuminator directs light into said chamber containing said sample and collects light produced by transmittance passing through said sample.

20 20. An apparatus according to claim 19, wherein said light filter comprises:

 a plurality of light source excitation filters;

 a plurality of sample emission filters;

 wherein said light source excitation filters block wavelengths of said light emanating from said light source and said sample emission filters block wavelengths of said light emanating from said sample.

21. (Amended) An apparatus according to claim 20, wherein said light source excitation filters are mounted on a first wheel and said sample emission filters are mounted on a second wheel and both said wheels permit rotation of said filters into and out of a path of said light; and

5 wherein said field illuminator further comprises means for synchronizing said first wheel and said second wheel such that all desirable combinations of said light source excitation filters and said sample emission filters can be used during said tests.

10 22. An apparatus according to claim 21, wherein said field illuminator further comprises:
a light diverting prism; and
a reference detector having means for quantifying an energy level of said light emanating from said light source, wherein said quantified energy level is selectively used in evaluating said light emanating from said sample by fluorescence.

15 23. An apparatus according to claim 2, wherein said means for determining one of said through-plane thickness or said volume of said sample field includes said information retrieving means retrieving information from a label concerning the chamber which information includes one of said through-plane thickness of said sample field or said volume of said sample field.

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24. An apparatus for testing a sample of biologic fluid quiescently residing within a chamber, said apparatus comprising:

— a field illuminator for selectively illuminating a field of the sample, said sample field having a known or ascertainable area;

5 ————— a positioner, which is operable to selectively change the position of one of the chamber or said field illuminator relative to the other of the chamber or said field illuminator, thereby permitting selective illumination of a plurality of said sample fields within chamber; and

means for spatially locating the chamber relative to said field illuminator, wherein said means for spatially locating the chamber relative to said field illuminator enables said field illuminator to be aligned with a particular spatial location within said chamber.

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25. An apparatus for testing a sample of biologic fluid, said apparatus comprising:

(a) a disposable container having a label and a chamber for quiescently holding the sample, said label containing information which is used in the performance of one or more tests on the biologic fluid sample quiescently residing within said chamber;

5 (b) a reader module which receives said disposable container, said reader module including:

a label reader for reading said attached label, and thereby accessing said information;

a field illuminator for selectively illuminating a field of the sample, said sample field having a known or ascertainable area;

a positioner, which is operable to selectively change the position of one of said chamber or said field illuminator relative to the other of said chamber or said field illuminator, thereby permitting selective illumination of a plurality of said sample fields within said chamber; and

means for spatially locating said chamber relative to said field illuminator; wherein said means for spatially locating said chamber relative to said field illuminator enables said field illuminator to be aligned with a particular spatial location within said chamber.

20 26. An apparatus according to claim 25, wherein said reader module further comprises:

an image dissector, for converting an image of light passing through or emanating from each said sample field into an electronic data format useful for test purposes.

25 27. (Amended) An apparatus according to claim 26, wherein said reader module further comprises:

means for determining one of a through-plane thickness of or a volume of said sample field.

28. An apparatus according to claim 27, further comprising:
a programmable analyzer having a central processing unit;
wherein said label reader transfers said information to said programmable analyzer, and
5 said programmable analyzer interprets said information, identifying said one or more tests to
be performed on the biologic fluid sample.

29. An apparatus according to claim 28, wherein said programmable analyzer contains a
10 plurality of instructions for performing said one or more tests.

30. An apparatus according to claim 29, wherein said plurality of instructions are
contained remote from said programmable analyzer and are accessed through said
programmable analyzer.

15 31. (Amended) An apparatus according to claim 25, wherein said reader module further
comprises:

means for determining one of a through-plane thickness or a volume of said sample
field.

32. A method for testing a sample of biologic fluid, comprising the steps of:

— providing a container for holding the sample, said container having a chamber with a first wall and a transparent second wall, and a label attached to said container, said label containing information which is used in the performance of one or more tests;

5 — providing a reader module which receives said container, said reader module including a label reader for reading said label and a field illuminator for selectively illuminating one or more fields of the sample, each sample field having a known or ascertainable area;

— depositing said sample within said chamber, wherein said sample quiescently resides in said chamber thereafter;

10 — reading said label with said label reader, thereby communicating to said reader module from said container said information which is used in the performance of said one or more tests; and

— selectively imaging one or more of said sample fields using said field illuminator.

15 33. A method according to claim 32, further comprising the steps of:

— providing a positioner within said reader module, said positioner being operable to selectively change the position of one of said chamber or said field illuminator relative to the other of said chamber or said field illuminator;

— selectively positioning said chamber relative to said field illuminator.

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34. A method according to claim 33, further comprising the steps of:

— providing means for spatially locating said chamber relative to said field illuminator;

— positioning said field illuminator relative to said chamber using said spatially locating means.

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35. A method according to claim 34, further providing the step of:
— providing a through-plane thickness or a volume of said sample field and a spatial location of said sample field as a part of said information used in the performance of said one or more tests.

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36. A method according to claim 34, further comprising the steps of:
— providing a known concentration of a sensible colorant uniformly distributed within the sample, said sensible colorant having a known signal to concentration ratio;
— providing said concentration, said signal to concentration ratio, and a spatial location of said sample field as a part of said information used in the performance of said one or more tests;
— positioning said field illuminator to align with said sample field at said spatial location;
— imaging said sample field;
— determining a volume of said sample field using said information including said image of said sample field, said concentration, and said signal to concentration ratio.

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15. 37. A method according to claim 36, further comprising the steps of:
— providing a reservoir attached to said container and a selectively operable valve functionally disposed between said reservoir and said chamber;
— 20 depositing said sample within said reservoir prior to said one or more tests;
— initiating a test time period by selectively operating said valve to allow said sample to transfer from said reservoir to said chamber.

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38. A method according to claim 34, further comprising the steps of:

providing a sensible colorant uniformly distributed within the sample, said sensible colorant having a signal to concentration ratio;

providing as a part of said information used in the performance of the one or more

5 tests a first spatial location for locating a first sample field, a second spatial location for locating a second sample field, wherein said first and second fields have equal volumes, and a geometric characteristic having a displacement volume, said characteristic positioned within one of said first or second sample fields;

10 positioning said field illuminator to align with said first spatial location;

imaging said first sample field;

positioning said field illuminator to align with said first second location;

imaging said second sample field;

15 determining said volume of one of said first or second sample fields using said images of said first and second sample fields, said displacement volume of said geometric feature, and said signal to concentration ratio.

39. A method according to claim 34, further comprising the steps of:

providing a sensible colorant uniformly distributed within the sample, said sensible colorant having a signal to concentration ratio;

providing as a part of said information used in the performance of the one or more

5 tests, a first spatial location for locating a first sample field, a second spatial location for locating a second sample field, and a geometric characteristic positioned within one of said first or second sample fields, said characteristic having a height;

positioning said field illuminator to align with said first spatial location;

imaging said first sample field;

positioning said field illuminator to align with said first second location;

imaging said second sample field;

determining said volume of one of said first or second sample fields using said images of said first and second sample fields, said height of said geometric feature, and said signal to concentration ratio.

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40. A method for testing a sample of biologic fluid, comprising the steps of:

—providing a container for holding the sample, said container having a chamber with a first wall and a transparent second wall;

—locating one or more features at spatial locations within said chamber, each said feature being operable to enable the testing of the sample;

depositing said sample within said chamber.

_____ depositing said sample within said chamber, wherein said sample quiescently resides in said chamber thereafter;

providing a reader module which receives said container, said reader module including a field illuminator for selectively illuminating one or more fields of the sample, each said sample field having a known or ascertainable area;

positioning said field illuminator to align with said spatial location of said feature;

selectively imaging one of said sample fields which contains said feature using said field illuminator.

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41. An apparatus for testing a sample of biologic fluid, said apparatus comprising:
a container having a chamber for quiescently holding the sample during the test, one or
more features operable to enable the testing of the sample, wherein at least one of the one or
more features is positioned at a known spatial location within the chamber, and a label
5 containing information which is used in the performance of one or more tests on the sample,
wherein the information includes the spatial location of the at least one feature located within
the chamber; and

a reader module operable to perform the testing of the sample, wherein the reader
module includes:

10 a label reader for reading the label, and thereby accessing the information
including the spatial location of the at least one feature located within the chamber;

15 a field illuminator for selectively illuminating a field of the sample quiescently
residing within the chamber, wherein the sample field has a known or ascertainable
area; and

20 a positioner, which is operable to selectively change the position of one of the
chamber or the field illuminator relative to the other of the chamber or the field
illuminator, to align the field illuminator with a field of the sample in which the at least
one feature at a known spatial location within the chamber is positioned.

25 42. The apparatus of claim 41, wherein the reader module further comprises:

an image dissector, for converting an image of light passing through or emanating from
each sample field into an electronic data format useful for test purposes.

43. The apparatus of claim 41, wherein the reader module further comprises:

25 means for determining one of a through-plane thickness or a volume of the sample
field.

44. The apparatus of claim 41, further comprising means for determining one of a through-plane thickness or a volume of the sample field.

45. An apparatus for testing a sample of biologic fluid, said apparatus comprising:

5 a container having a chamber for quiescently holding the sample during the test, and one or more features operable to enable the testing of the sample, wherein at least one of the one or more features is positioned at a known spatial location within the chamber; and

a reader module operable to perform the testing of the sample, wherein the reader module includes a field illuminator for selectively illuminating a field of the sample quiescently residing within the chamber during the test, and a positioner that is operable to selectively change the position of one of the chamber or the field illuminator relative to the other of the chamber or the field illuminator, to align the field illuminator with the field of the sample in which the at least one feature at the known spatial location within the chamber is positioned.

10 15 46. The apparatus of claim 45, further comprising means for determining one of a through-plane thickness or a volume of the sample field.